

PATENT SPECIFICATION

408,406

Application Date: Dec. -28, 1932. No. 36,660/32.

Complete Left: Dec. 28, 1933.

Complete Accepted: April 12, 1934.

PROVISIONAL SPECIFICATION.

Improvements in or relating to Optical-projection Apparatus.



We, HARRY GRINDELL MATTHEWS, British Subject, and LUMINASTRA LIMITED, a British Company, both of Midland Bank Chambers, Bromley, in the County of Kent, do hereby declare the nature of this invention to be as follows:—

This invention relates to optical projection into the sky.

It has already been proposed to project light into the sky so as to produce luminous signs, by forming optically high in the sky by means of a lens of long focal length, a real image of a stencil or transparency illuminated by a searchlight.

The object of the present invention is to obtain an image of maximum brilliance with optical projection apparatus of the kind described.

In the optical projection apparatus according to the present invention, whilst an image of a stencil or transparency illuminated by a searchlight is formed in the sky by a lens of long focal length, the searchlight is of larger diameter than the stencil or transparency and the beam of light from the searchlight is convergent and its angle of spread is reduced by a lens in proximity to the stencil or transparency.

Preferably the lens which reduces the angle of spread of the beam is a diverging lens which reduces the convergence of the beam from the searchlight.

By the above described optical arrangement, the stencil or transparency is illuminated by a concentrated beam of light produced by a searchlight of large diameter, but, in spite of the convergence of the beam to concentrate the light on the stencil or transparency, undue spread of the beam and consequent diminution of brilliance of the image is avoided by the reduction of the convergence by the diverging lens.

The diverging lens is preferably of such negative focal length and the convergence of the beam due to the relative locations of the reflector and arc of the searchlight are such that the beam after passing through the diverging lens is still slightly convergent. The resultant

beam however may be parallel or even slightly divergent.

As the beam therefrom is to converge, the reflector of the searchlight is preferably of elliptical curvature and not parabolic.

The stencil or transparency is best situated immediately after the diverging lens, that is on the face thereof remote from the searchlight.

The diameter of the objective lens of long focal length whereby the image is formed in the sky can also be kept small, for instance approximately the same or even less than that of the stencil or transparency, which is considerably less than that of the searchlight.

The objective lens is of long focal length, of for instance the order of 15 feet, in order to keep small the angle of spread due to the objective.

To obtain a beam of intense light whilst keeping small the spread of the beam due to the diameter of the crater of the arc, necessitates a searchlight of large diameter. This is due to the reflector having to be situated sufficiently far from the arc to keep small the angle of spread due to the arc, and the reflector must cover an angle of rearwardly directed light emission of almost 180°.

Preferably the long focus objective lens is of a non-spherical curvature such as to give good definition over the whole of the field, and is concavo-convex with the convex surface outwardly directed.

Although for the very practical purpose of keeping the overall length of the apparatus as short as possible a diverging lens is employed which reduces the convergence of the beam from the searchlight, it is possible, but would be inconvenient, to use a converging lens situated beyond where the converging beam crosses or comes to a focus and where it has commenced to diverge, to render the beam approximately parallel.

Dated this 28th day of December, 1932.

PHILLIPS & LEIGH,
Agents for the Applicants.

COMPLETE SPECIFICATION.

Improvements in or relating to Optical-projection Apparatus.

We, HARRY GRINDELL MATTHEWS, British Subject, and LUMINA STRA LIMITED, a British Company, both of Midland Bank Chambers, Bromley, in the County of Kent, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

10 This invention relates to optical projection into the sky.

It has already been proposed to project light into the sky so as to produce luminous signs, by forming optically
15 high in the sky by means of a lens of long focal length, a real image of a stencil or transparency illuminated by a searchlight.

The object of the present invention is to obtain an image of maximum brilliance with optical projection apparatus of the kind described.

It has already been proposed in optical projection apparatus, to employ a reflector and a source of light to produce
25 a beam having a large angle of convergence and to reduce the angle of convergence by means of either a negative lens located between the reflector and the focus of the reflector or a lens system located beyond such focus. The use in such an optical projection system of an elliptical reflector with the source of light located at a focus of the ellipse has
30 also been proposed.

In optical projection apparatus according to the present invention, comprising a projecting lens of long focal length whereby an image of a stencil or transparency illuminated by a searchlight is formed in the sky, using mist or cloud as a screen, the searchlight mirror is of larger diameter than the stencil or transparency and the beam of light from the searchlight is convergent and its angle
40 of spread is reduced by a lens in proximity to the stencil or transparency.

Preferably the lens which reduces the angle of spread of the beam is a diverging lens which reduces the convergence
50 of the beam from the searchlight.

An optical projection system as above described is illustrated diagrammatically, by way of example, on the accompanying
55 drawing, in which:—

a is the mirror of a searchlight of which b is the source of light, viz. a carbon arc.

The searchlight mirror a and the

searchlight arc b are so relatively positioned that the beam of light from the mirror a is convergent.

c is a diverging lens whereby the angle of spread and the convergence of the beam are reduced before the beam impinges on a stencil or transparency d of considerably smaller diameter than the searchlight mirror a .

An image of the illuminated stencil or transparency d is projected in the sky by a lens e of long focal length.

By the above described optical arrangement, the stencil or transparency d is illuminated by a concentrated beam of light produced by a searchlight $a b$ of large diameter, but, in spite of the convergence of the beam to concentrate the light on the stencil or transparency d , undue spread of the beam and consequent diminution of brilliance of the image is avoided by the reduction of the convergence by the diverging lens c .

The diverging lens c is preferably of such negative focal length and the convergence of the beam due to the relative locations of the reflector a and arc b of the searchlight are such that the beam after passing through the diverging lens c is still slightly convergent. The resultant beam however may be parallel or even slightly divergent.

As the beam therefrom is to converge, the reflector a of the searchlight is preferably of elliptical curvature, and not parabolic. The arc is at one focus of the ellipse and the position of the second focus controls the focal length and position of the diverging lens, having regard to the focal and desired position of the objective lens e .

The stencil or transparency d is best situated immediately after the diverging lens c , that is near the face thereof remote from the searchlight $a b$.

The objective lens e is of long focal length, of for instance the order of 15 feet, in order to keep small the angle of spread due to the objective.

To obtain a beam of intense light whilst keeping small the spread of the beam due to the diameter of the crater of the arc b , necessitates a searchlight of large diameter. This is due to the reflector a having to be situated sufficiently far from the arc to keep small the angle of spread due to the arc b , and the reflector a must cover an angle of rearwardly directed light emission of

almost 180°.

Preferably the long focus objective lens *e* is of a non-spherical curvature such as to give good definition over the whole of the field, and is concavo-convex with the convex surface outwardly directed.

Although for the very practical purpose of keeping the overall length of the apparatus as short as possible a diverging lens *c* is employed which reduces the convergence of the beam from the searchlight *a b*, it is possible, but would be inconvenient, to use a converging lens situated beyond where the converging beam from the searchlight crosses or comes to a focus and where it has commenced to diverge, to render the beam approximately parallel.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. An optical projection apparatus for forming an image of a stencil or transparency illuminated by a searchlight, by

a lens of long focal length, in which the searchlight mirror is of larger diameter than the stencil or transparency and the beam of light from the searchlight is convergent and its angle of spread is reduced by a lens in proximity to the stencil or transparency.

2. An optical projection apparatus as set forth in claim 1, in which the lens reducing the angle of spread of the beam is a diverging lens reducing the convergence of the beam.

3. An optical projection apparatus as set forth in claim 2, in which the stencil or transparency is situated near the face of the diverging lens remote from the searchlight.

4. The apparatus for optical projection into the sky substantially as described and diagrammatically illustrated.

Dated this 28th day of December, 1933.

PHILLIPS & LEIGH,
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Agents for the Applicants.

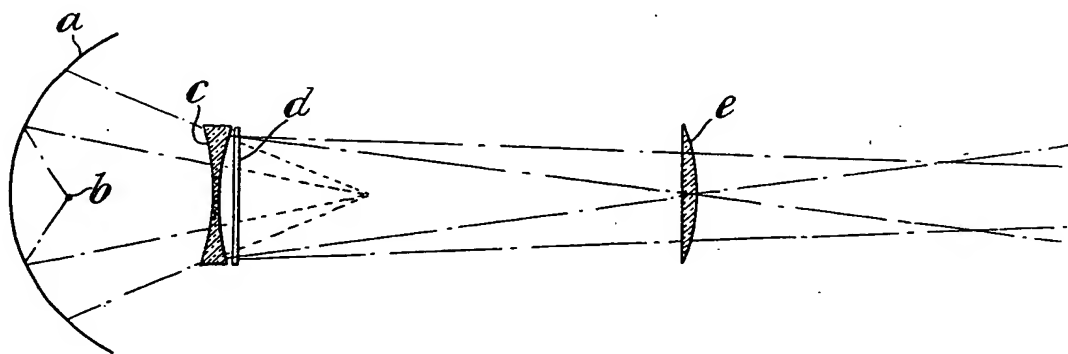
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[This Drawing is a reproduction of the Original on a reduced scale.]



THE UNITED STATES OF AMERICA
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

WYOMING
SANDWICH MOUNTAIN
NATIONAL MONUMENT
LAND ACQUISITION
REPORT

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